AMENDMENTS TO THE SUBSTITUTE SPECIFICATION

Replace the paragraph beginning at page 8, line 21 with:

The time-frequency transforming means 3 includes ion current sampling means 7 and ion current sampled value transforming means 8 shown in Fig. 2. The time-frequency transforming means 3 first determines ion current sampled values x(0), x(ΔT), x(2ΔT), ... from the detected ion currents with respect to 0, ΔT, 2ΔT, ...~~that~~ which are fixed intervals from a starting point determined by the detection control means 5. In this embodiment,~~a case where~~ ΔT = 5μs is used as an example, but ΔT can be optionally set depending on conditions.

Replace the paragraph beginning at page 9, line 16 with:

Next, the time-frequency transforming means 3 determines the frequency components $C_n(f)$ in respective time~~intervals~~ periods of each time interval from the sampled ion currents ~~included~~ in the time~~intervals~~ periods. These sampled ion currents are represented by the set In = (Tn, Tn+ΔT, ..., Tn+(M-1)ΔT), where M represents the number of such ion current samples in each time interval. The~~set of~~ time intervals~~includes~~ include overlaps in an amount determined by the detection control means 5. That is, here, the time-frequency transforming means 3 sets, as shown in Fig. 3, a set of time intervals with one or more overlaps of adjacent time intervals,~~in the time period~~ from the ignition determined by the detection control means 5 until another ignition occurs in a cylinder, samples the ion currents with respect to each time period in each time interval, and determines the frequency components of each ion current sample. In the present embodiment, an example is described in which the total number of~~intervals~~ time periods in~~the set,~~ each interval is M = 256, and time~~intervals~~ periods are recursively defined as $T_{n+1} = T_n+(M/K)\Delta T$ (where K = 8 and n = 0, 1, 2, ...), but the effectiveness of the invention is not limited to these values.